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Auctions 101: Lessons from a Decade in the Lab. What Am I Bid for ...Safer Food?

Jason F. Shogren
University of Wyoming

Dermot J. Hayes
Iowa State University, dhayes@iastate.edu

John A. Fox
Kansas State University

Todd L. Cherry
University of Central Florida

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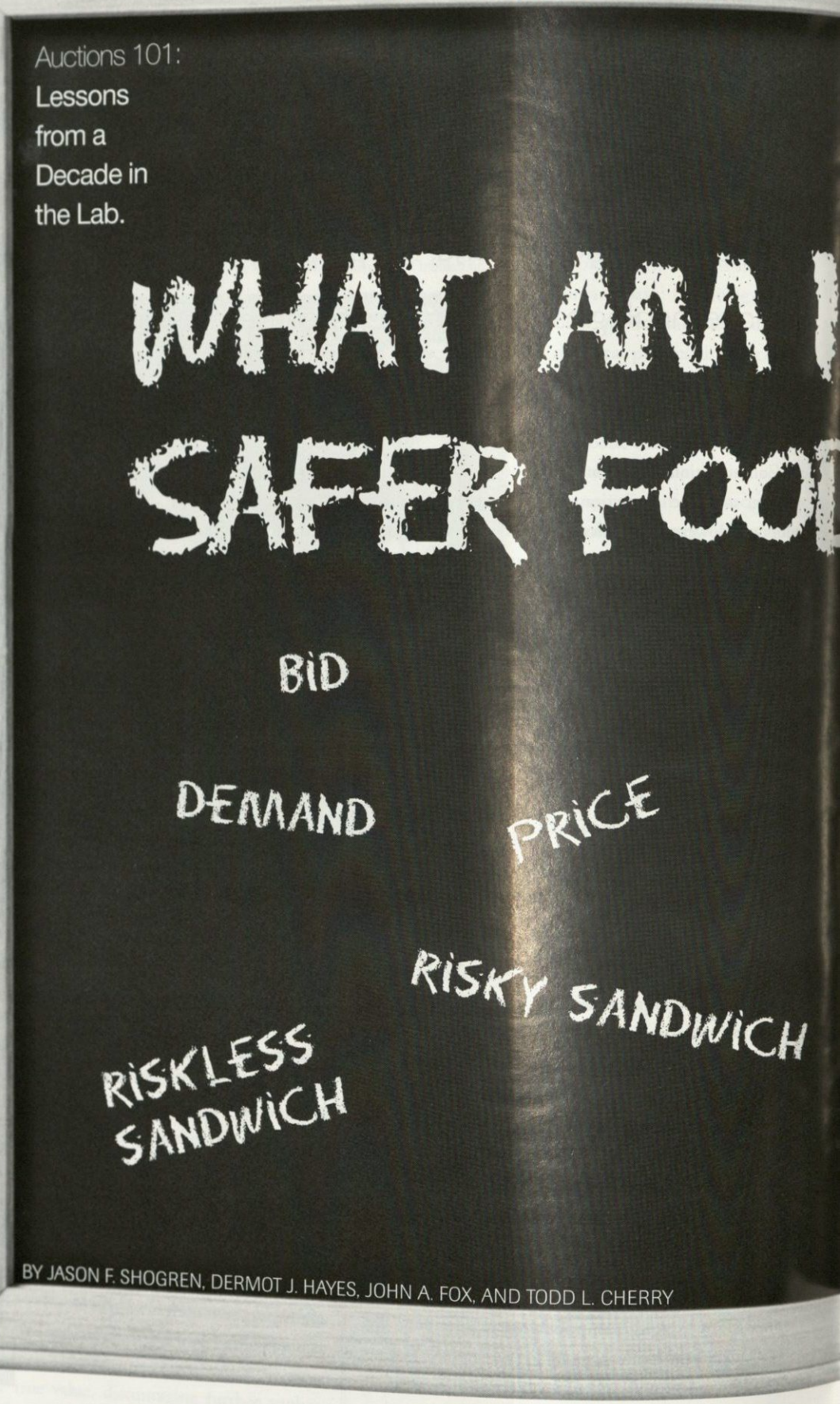
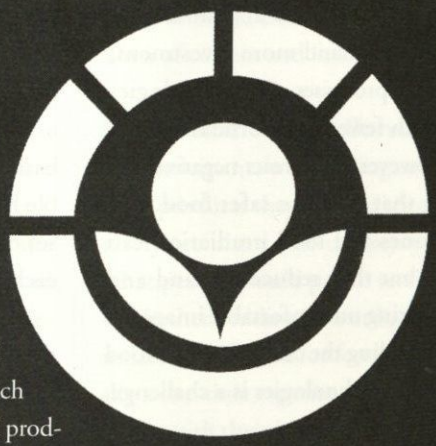


BY JASON F. SHOGREN, DERMOT J. HAYES, JOHN A. FOX, AND TODD L. CHERRY

BID FOR



Over a decade ago, we became interested in how consumers react to food safety and new food technologies. This led to a series of laboratory experiments that asked people to reveal their preferences in an auction environment in which they spent real money and consumed the actual food products. The auction environment is a surrogate market conducted under laboratory conditions of control and repetition. People came to a laboratory setting (a university taste-testing lab), and were asked to bid in an auction offering foods with different risks of foodborne illness. The auction was specifically designed to give people an incentive to tell the truth about their preferences for safer food.

The lab/auction model forced people to make real economic commitments, albeit in a setting more stylized than a retail store.

These experimental procedures have helped investigators learn things about consumer behavior toward food safety that would have been impossible to discover using any other procedure. This article describes some of the findings from the program, along with what insights can or cannot be learned in a laboratory environment.

The Search for Safety

Society's increased demand for safer food stems from the increased ability to detect and identify foodborne illnesses. Well-publicized outbreaks of *Salmonella* and *E. coli* 0157 have made the public more aware that foodborne disease makes people sick — an estimated 76 million illnesses in the United States, with over 300,000 hospitalizations and

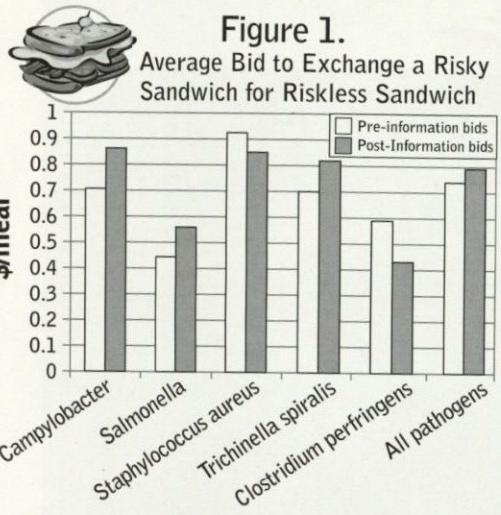


Figure 1.
Average Bid to Exchange a Risky Sandwich for Riskless Sandwich

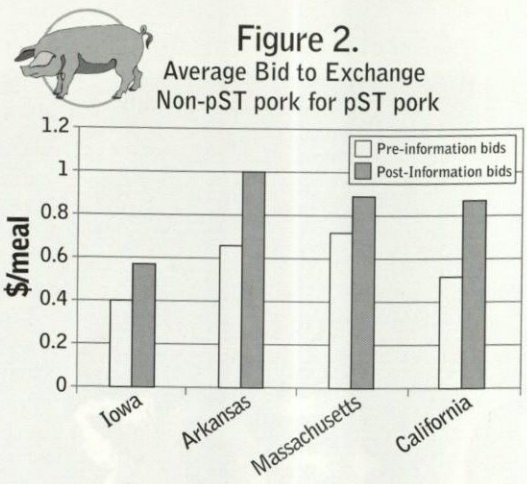


Figure 2.
Average Bid to Exchange Non-pST pork for pST pork

5,000 deaths, imposing tens of billions in annual costs (Meade et al.). People now demand more investment, both private and public, in processes and technologies that can produce food with fewer foodborne risks.

These same people, however, often react negatively to technological solutions that produce safer food. For example, growth hormones and food irradiation can make some foods safer, but they reduce demand and limit desirability by triggering uncomfortable images of the treated foods. Disentangling the desire for safer food from worries over new food technologies is a challenge.

Foodborne Pathogens

Participants underestimated the objective risk of foodborne pathogens, but experience with the market and information about probabilities of illness and death influenced their final assessment and valuation of these risks. We recruited the general public as well as university students to participate in our food safety experiments. The participants in the auctions said they would be willing to pay to reduce the individual and combined risks of five different foodborne pathogens — *Campylobacter, Salmonella, Staphylococcus aureus, Trichinella spiralis,* and *Clostridium perfringens.*

Evidence consistently suggests that people initially underestimate the risk of illness from foodborne pathogens (Hayes et al.). Even so, these people will pay significantly more for safer food on four of the five pathogens once they gain auction experience and receive objective information about risk. Providing auction experience translates into everyday market experience because it allows people to observe the actual market-clearing prices that emerge in the experiment. Providing objective information also translates into everyday experience when people receive new information about food safety from outside sources. We provided information on the objective probabilities of illness and death for each specific foodborne pathogen on a per-meal and an annual risk basis. We also provided the possible health impacts, such as nausea or diarrhea, associated with each pathogen.

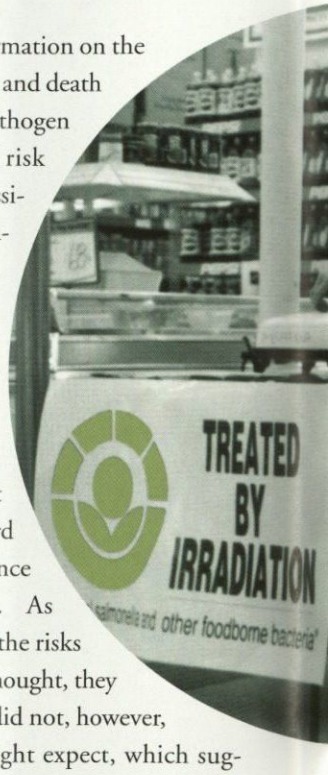


Figure 1 shows the average pre- and post-information bid by pathogen. People initially underestimated the risk associated with these pathogens, but adjusted their estimates upward after obtaining market experience and objective information. As expected, when people learned the risks were greater than they initially thought, they paid more for safer food. They did not, however, pay as much as economists might expect, which suggests people place more weight on their own initial beliefs than on the objective information.

People reacted in instinctive ways when they confronted small risks that could be associated with very serious outcomes. They ignored extremely small risks (a 1 in 10 million chance), but they reacted strongly to moderately small risks (a 1 in 100,000 chance). These results show that people have distinct reactions to food safety risks, a finding that policymakers might find useful when proposing new policy initiatives.

Participants seemed to possess general preferences and values for food safety, but not pathogen-specific preferences and values. In general, most people perceive that food in the U.S. is relatively safe, so they do not usually bother to distinguish among the risks posed by specific pathogens.

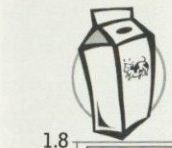


Figure 3.
Average Bid to Exchange bST-Milk for non-bST Milk

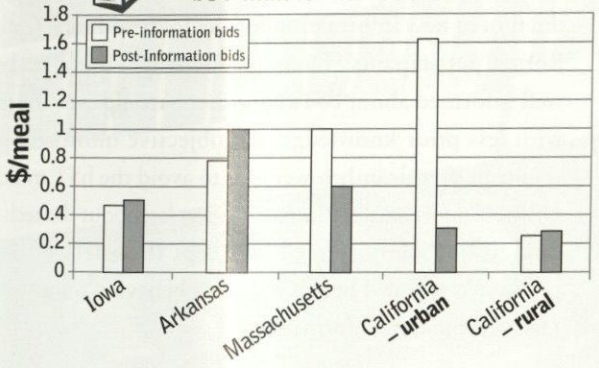
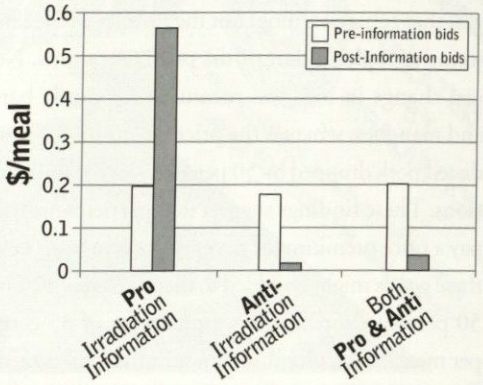
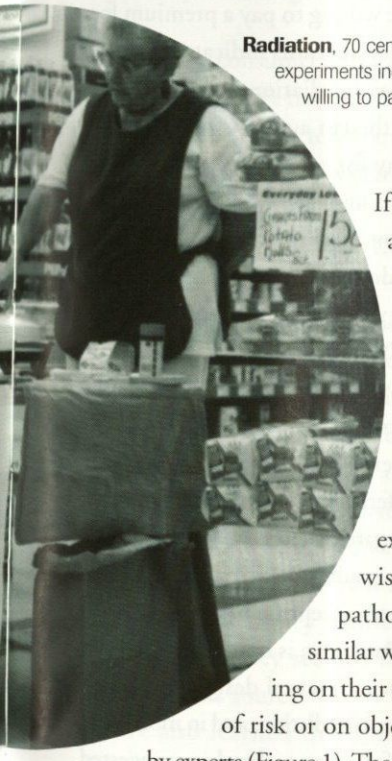


Figure 4.
Average Bid to Exchange Meat for Irradiated Meat



graphics in charts courtesy of Art Today



Radiation, 70 cents a meal: Laboratory auction experiments indicate consumers are generally willing to pay a premium of 70 cents a meal.

If people did differentiate among specific pathogens, the values elicited for the combined risk from all pathogens should be significantly higher than the values elicited for each individual pathogen.

However, results of the experiments suggest otherwise. Combined and pathogen-specific values were similar whether the person was acting on their own subjective perception of risk or on objective risk levels provided by experts (Figure 1). The values arising from the laboratory auctions indicate that the average participant was willing to pay approximately $0.70 per meal for safer food. Transferring these values to the U.S. population makes the value of food safety at least three times larger than previously available estimates — perhaps enough to justify the costs of current and future food safety regulations.

What Price Safety? Survey Says...

Participants were willing to pay a price premium for food products they had not tried before. The $0.70 food safety premium exceeded some experts' expectations of what people would pay in retail markets. The question is whether bidding in a unique lab environment might inflate the demand for food safety. Lab auctions are usually a one-time experience, and participants might experiment with their bids, bidding high because the costs of doing so are low. An alternative explanation for the high price premia is that people will pay extra to sample a new and exotic food product to see if they like it or not. Many bidders in the experiment have never experienced the goods up for auction. In the case of irradiated meat, a bid reflects two elements of value: the consumption value of the good, and the information value of learning how the good fits into his or her preferences.

We tested these competing explanations by auctioning off three goods that vary in familiarity — candy bars, mangoes, and irradiated pork — in four consecutive experimental auctions over a two-week period. The results sug-

The Accuracy of Valuation Experiments

In a separate study we compared valuation behavior in a lab experiment to results from a mail survey and to a retail sales trial in a local supermarket in Manhattan, Kansas. When the irradiated meat product was offered at the same price or a 10 percent discount, we observed both the experimental lab and the mail and survey overestimated the willingness to pay for irradiation relative to the in-store retail trials (Figure 4). When the product was offered at a premium price, however, the survey and experimental results predicted market share in a retail market remarkably well. About thirty percent of survey respondents, experimental market participants, and shoppers were willing to pay a 10 percent premium for the irradiated chicken, and fifteen to twenty percent were willing to pay a 20 percent premium.

gest that actual learning, not the novelty of the lab, seems to explain some of the price premiums. No real change in bids was measured for candy bars and mangoes, whereas the price premium for irradiated pork dropped by 50 percent over the four sessions. These findings suggest that participants will pay a price premium for new products to learn how these goods might be added to their preferences. The 50 percent drop suggests a premium of 35 cents per meal for safer food, an amount that still exceeds any other estimates.

Better Food Through Growth Hormones?

Participants generally preferred low-calorie hormone treated pork, but some consumers exhibit a strong and persistent aversion to hormone treated food. We used a separate experimental auction to elicit the willingness to pay to consume (or avoid consuming) pork that was lean because of genetically engineered growth enhancers. The new auction was designed to separate the value of positive and negative attributes — the pros being leaner meat, and the cons being hormone treatment. While results show the average participant will pay to avoid hormone treatments, she will pay a greater amount for the improved quality of the meat. Findings imply that the typical participant will pay a high premium for hormone treated pork.

Familiarity with new technology increased acceptance, and this familiarity can be learned locally or taught during an experiment. We used the lab auctions to examine consumer preferences for somatotropin growth enhancers, either pST pork or bST milk, in different regions in the United States: Iowa, Arkansas, Massachusetts, and California. We used between fifteen and thirty participants in each treatment. The results for the pork valuation auctions suggest that the average participant had a significant preference for the leaner pork that came from the pST hormone treatment (Figure 2). For bST milk, because there is no offsetting nutritional benefit for the consumer, most participants were initially willing to pay to avoid hormone treatment (Figure 3).

Halfway through each experiment, we introduced objective scientific information about growth hormones to the consumers. In the milk treatments, we observed no significant change in bidding following the introduction of new information for the Iowa and rural California participants. These participants were already well informed about bST. For other participants, those with less prior knowledge, the objective information results in significantly lower bids to avoid the bST milk. Urban Californians, for instance, knew less about the technology, but many seemed to accept the safety of the product as revealed by their bidding behavior, once they received the new information.

What About Irradiation?

Most participants were willing to pay a premium for irradiated food. Laboratory auctions indicate that participants are not opposed to irradiation as a technology to reduce risk. We used the lab auctions to elicit participant willingness to pay for safer meat without disclosing the risk reduction technology. We then compared these results to equivalent auctions in which USDA information was used to describe the technology. Consumer willingness to pay was statistically equal in each case — approximately $0.80 per meal — and over 70 percent of participants were willing to pay a premium for the irradiated product.

Negative reports concerning irradiation had a larger impact on participant preference and values than positive reports—even when the negative reports were unscientific. We found some puzzling results. Participants in the lab auctions appeared to be very accepting of new technologies, whereas the average American is not. The key to this conundrum is that the experimental design controlled the flow of information about irradiation, and in most cases, the formal descriptions of the new technology suggested that the process was safe and beneficial. The lab allowed us to address this issue directly, and one of our most surprising results came when we experimented with negative descriptions taken from activist groups.

We examined how consumer willingness to pay for safer pork sandwiches was affected by alternative descriptions of food irradiation. Results follow intuition with favorable descriptions of irradiation increasing willingness to pay and unfavorable descriptions decreasing willingness to pay. When presented with both a favorable and unfavorable description, the participants acted as if they had read only the negative information. Apparently, the negative information dominated (Figure 4). This relative impact of unfavorable information was evident even when the negative representation was a non-scientific account

photo courtesy John Fox

Chicken special, hold the bacteria: Laboratory auction experiments indicate that consumers are willing to pay an average premium of 35 to 70 cents per meal for food free of dangerous pathogens. Irradiation is one of the more effective methods of controlling foodborne pathogens.

written by a consumer advocacy group. This result illustrates the incentive that partisan groups have to promote their claims in order to advance an agenda that yields a possible loss in general welfare.

Conclusion: A Role for Consumer Experimentation

Experiments can be designed to address specific questions on how people value new and controversial food products. After many replications over a decade of work, these experimental procedures have passed one critical test. We now know things about consumer behavior that we might not have discovered otherwise. One example stands out: when faced with both positive and negative information about new food technologies, participants react as if they had received only the negative information. They seemed to react to bad news irrespective of its source.

We also learned that limits exist to what can be achieved with lab experiments for valuation work. We had hoped to obtain refined information about the value of reducing the effects of individual pathogens. In the end we detected only general preferences about food safety. Subtle changes in experimental procedures such as whether we paid the participants ahead of time, the choice of auction, asked for willingness to pay or willingness to accept, or posted market-clearing prices could significantly impact the results.

Finally, we discovered that bids for new foods or food processes could be unrealistically high when participants viewed them as a novelty. Despite these limits, our experience leads us to conclude that over time, and as designs are refined, improved reality-based consumer experiments will become an important method for analyzing the demand side of food safety.

For More Information

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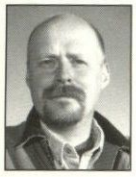

Jason Shogren is Strook Distinguished Professor of Natural Resources Conservation and Management in the Department of Economics and Finance at the University of Wyoming. Dermot J. Hayes holds the Pioneer Hi-Bred International Chair in Agribusiness in the Department of Economics at Iowa State University. John A. Fox is Assistant Professor of Agricultural Economics at Kansas State University. Todd L. Cherry is Assistant Professor in the College of Business Administration at the University of Central Florida.